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Rand's Pneumatic Gas Machine.

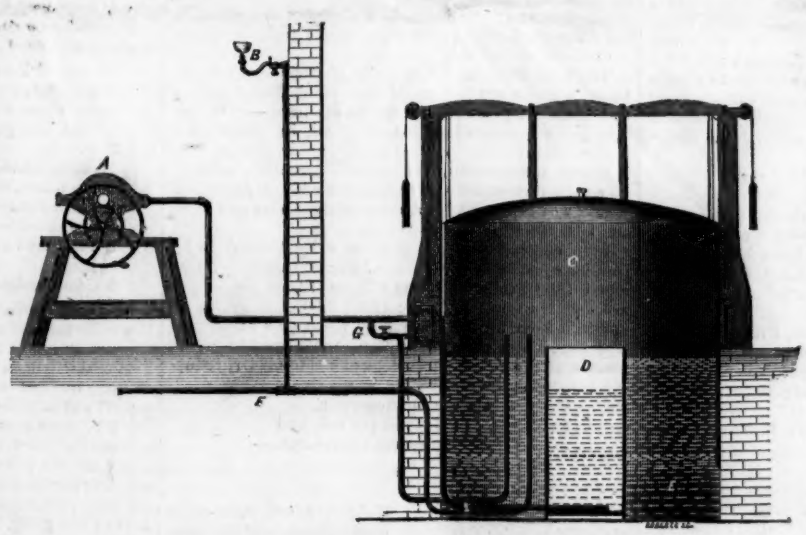
Few people of the millions who enjoy the luxury of gas-light have an idea of the great amount of time, labor, capital and ingenuity employed in the various branches of legitimate gas manufacture. Experiments and improvements are constantly being made with a view to cheapen and simplify its production; and to adapt and perfect apparatus to supply the demands of our largest cities, smallest town, or even a single dwelling.

Among the more recent and important improvements in the manufacture of gas, may be mentioned A. C. Rand's Pneumatic gas, which is illustrated herewith.

The difficulties and objectionable features heretofore met with in the different methods employed to carbonize air with liquid hydrocarbons, to produce a practically permanent illuminating gas, seems to have been overcome. The remarkable simplicity and utility of this process is so apparent as to readily commend itself to the public.

The apparatus is fully shown in the accompanying engraving. It consists of a water tank (E) surrounding the hydrocarbon tank (D) and covered by the iron gasholder (C) At A is an air pump which forces the air through pipe (G) until it issues through the fine perforations, where it ends in the bottom of the tank (D). This allows the air to pass in small streams which bubbles up through the hydrocarbon, which converts it into illuminating gas. At (F) is the eduction or distributing pipe, connecting with the burner at (B). The branch pipe (G) supplied with a stop-cock is to introduce air directly into the tank when necessary, to dilute and regulate the illuminating power of the gas within the holder.

The tank containing the hydrocarbon is placed in the ground below the frost point and the effect of solar heat. It is surrounded by water kept at a uniform temperature by the earth. The whole is encased by an ordinary iron gasholder.



RAND'S PNEUMATIC GAS MACHINE.

Two very important objects are obtained by this: First, a uniformly cold temperature, which wonderfully lessens the liability to condensation in the pipes leading to the burners. Second, its *perfect safety against accidents by fire.*

The capacity of the tanks will provide ample and safe storage, sufficient to last a year or more if necessary. This overcomes the serious objections to portable or automatic gas machines where the material is dangerously exposed in small receptacles requiring constant change and renewal; and is liable also, to variations of temperature which hastens or retards evaporation, whereby the illuminating power constantly varies.

The holder is filled by working the air pump a few moments each day, and the gas becomes perfectly uniform in quality, quite similar to ordinary coal-gas. It is superior, however, to coal-gas, inasmuch as it contains no carbonic acid, no sulphuretted hydrogen, no ammonia, or any of its salts, so deleterious to health and offensive in odor.

One of Mr. Rand's patents provides for a uniform quality of gas irrespective of the specific gravity or volatility of the liquid hydrocarbons, by means of a series of carbonizing compartments, one or more to be employed as required.

Another patent is for making gas from crude petroleum, and is intended to operate on a scale for gas works of any magnitude. This consists briefly in heating the liquid, when confined in a close iron tank, by a coil of steam pipe and passing air up through it in fine streams. This charges the air with the volatile vapors and more permanent gases which are always present in petroleum. These vapors are then conducted by pipes into a tank placed in the ground surrounded by water, for the purpose of condensing all that is condensible.

This forms the liquid known as gasoline. The non-condensible vapor or gas passes on and is conveyed by means of a pipe into the gasholder fit for distribution like ordinary gas; thus saving and converting into gas what is lost in ordinary distillation of petroleum.

It is a well known fact in chemistry that rapid evaporation produces intense cold. Automatic machines have constant evaporation taking place while the lights are burning, and consequently constant reduction of temperature to refrigeration is going on, and unless artificial heat is employed to regulate the temperature the quality of gas is constantly changing.

Hence it is, in automatic machines, the gas when first lighted emits smoke, and at a later period a diminution of light occurs, and finally it becomes a blue non-luminous flame—the temperature being too low to take up the hydrocarbon vapor sufficiently to produce gas.

The foregoing objections are completely overcome in Rand's process, and its adaptability for small communities, hotels, factories and private dwellings out of the reach of gas works, is a consideration that cannot be too highly estimated.

The patentee states that complete gas works can be constructed on this plan at a comparatively small outlay, that cannot get out of order, and requiring no skill and little labor; five minutes per day being sufficient to supply gas for thirty burners four hours each, which will be entirely free from odor in combustion, and produce a superior light at a minimum of cost compared with any other artificial light known.

Among the important features resulting from this process of manufacturing gas claimed by the inventor, may be enumerated:

First: The gas is not liable to condensation.

Second: It will readily mix with coal-gas, and when mixed does not separate.

Third: An inferior quality of coal-gas is converted into gas of high candle-power by mixing with it.

Fourth: The gas made by this process is more uniform in quality than that made by any other apparatus.

Fifth: The carburator does not required to be charged with material but once in a year or two, or longer if desired.

Sixth: Dispenses entirely with machinery; therefore can never get out of order.

Seventh: At the present commercial value of petroleum the gas can be made for less than one-half the cost of coal-gas.

Eighth: Enough gas can be made in from five to thirty minutes to supply dwellings, hotels, or factories using from twenty-five to one thousand burners.

Ninth: The impossibility of any accident; the tank holding the material being placed in the ground, surrounded by water, and covered with iron, guarantees absolute safety.

Tenth: It it the only gas apparatus that insurance companies do not class as extra hazardous.

We understand the Metropolitan Gas Company, of New York, after many months' trial and testing to demonstrate the travelling power and non-comdensability of the gas practically, and also its illuminating power when used alone or mixed with coal gas, have purchased the right to use the patents in their district.

For further particulars, address Messrs. RAND & SUNDERLIN, No. 99 Maiden Lane, New York.

Porosity of Cast Iron.

The porosity of cast-iron is a well-known fact Many years ago, Mr. Perkins forced water through thick plates of it; hence it is not astonishing that gases pass with ease. A few years ago, a physician at Chambéry was struck with the circumstance that an epidemic of fever occurred in Savoy every winter; and he fancied that he had traced the cause to the use in the cottages of cast-iron stoves, which allowed the gases of combustion to pass into the atmosphere of the rooms.

The subject has been investigated by MM. Deville and Troost, and they find, by a very carefully conducted experiment, that hydrogen, carbonic acid, and carbonic oxyd do actually pass through the walls of a cast-iron stove, at a dull as well as a bright red heat. The fact is worth knowing here, for such stoves are often used in the country, and most frequently in ill-ventilated apartments.

The amount of gases which pass is certainly not large, but carbonic oxyd is an exceedingly poisonous agent, and most of the discomfort experienced in rooms heated by these stoves is no doubt attributable to that gas.

The subject deserves the attention of manufacturers who might possibly devise a tile or clay-lined stove that would diminish the inconvenience we mention, and at the same time economize fuel.—*American Artizan.*

Practical Management of Gas Works.

BY JAMES R. SMEDBERG.

[WRITTEN EXPRESSLY FOR THIS JOURNAL.]

NUMBER SIX.

In making the connections from the retort to the bridge pipe, a space of one-half inch must be left between the spigot-end of the ascension-pipe and the shoulder in the hub of the stand-pipe;—the weight of the former actually hanging from the bridge-pipe flanch. The object of this is to allow play when the castings are elongated by heat. This hub-and-spigot joint is not to be made until after the bench is brought to a working heat.

At any rate expansion room must be left in one or other of the joints on the rising pipe.

An indifference to this precaution in the use of clays will, in three cases out of four, crack the retort at or near its mouth; and we now know, what we did not formerly know, that the weight of mouth-piece, &c., does little damage to clay retorts compared to the enormous stress due to expansion. How great this stress is, I learned, when in my callow days, in using irons. Five benches of threes were working into a 13-inch cylindrical hydraulic main, and after making all my joints cold, and with no expansion space, for two years, I found that the upward thrust of the stand-pipes (the mouth-pieces serving as so many fixed fulcrums) had rolled the main over backward in its saddles to a degree which was at once unsightly and dangerous, and discreditable to myself personally. Upon this point Zerah Colburn ("Gas Works of London" p. 21–22) says:

"For fire brick retorts, socket mouth-pieces, enclosing the end of the retort are used at the Chartered Gas Company's work, and at those of the South Metropolitan—that is to say, the end of the retort extends into a socket 4 in. or 5 in. in depth, cast upon the back of the mouth piece, and generally three or more mouth-pieces are cast together upon a single plate, which is held, by tie bolts, against the brickwork. At some other gas-works, where brick retorts are used, the mouth-pieces are made without sockets. The sockets would, perhaps, be found advantageous, even with ordinary clay retorts. Cases have been known where the expansion of the ascension pipes (through which the gas rises from the retort) has been such as to lift the hydraulic main off its supports. In such cases a great strain must necessarily be thrown upon the mouth-piece joints, where a socket would afford great resistance against starting the bolts."

In many works may be seen a thick tarry deposite upon the interior of the mouth-pieces, which deposite, in extreme cases, so far chokes the throat of the retort as very seriously to obstruct the process of charging. Unless this be removed as fast as formed, and never suffered to acquire a noticeable thickness, it soon gains a metallic hardness and intimate cohesion such as no man can attack in the face of a white heat. Even where the practice is to remove it every day, I have seen men suffer considerably when using the clinkering bars, and can easily conceive how and why a gang of stokers will permit this accretion to form and accumulate, if they are not closely watched.

A clay retort must be carefully set in its place and when it rests upon a continuous flooring of tile, the bed (or layer of "poor-stuff") should be one-half or three-quarters of an inch in thickness, and made to conform as nearly as possible to any inequalities in the bottom of the retort. The retort should properly be one and a half inches less in length than the depth of the bench, thus bringing the outer face of the mouth-piece flush with the facing wall. Where retorts have been accidentally supplied of less length, the work behind them should be accurately and solidly carried up, and the retort driven hard against it.

As a means of reducing the loss of heat by radiation from the front of the bench, a 9-inch wall is necessary; and even thus confined, the heat thrown out by a well set bench of clays is sufficient to render the retort house space in front of it uncomfortably warm. It was, and to some extent still is, the practice to employ a heavy bar of 1¼-inch round iron, entirely, for freeing the grate of the accumulated clinker. And even now this bar is usefully employed for breaking up the mass longitudinally through the center; but for slicing the clinker clear of the brick no violent measures are advisable, and for this purpose a light iron bar with an edged hook and heel at its end is most appropriate. Its adoption preserves the furnace to an extent not easily believed by those who have never tried it.

The scoop should be a true semi-cylinder of boiler iron, closed at one end and rounded off at the other, a scoop to carry 110 lbs. of coal weighing 80 lbs. *when new*. Of course, the scoop spreads so as to hold more coal, and loses weight by constant friction against the mouth-piece, as it is used.

There is great difference of opinion as to the relative merits of 4-hour and 5-hour charges, from the simple fact that it is one of those cases in which practice conflicts with theory. *Theoretically*, the shorter period of distillation is better, and I admit that it is practically better in the use of irons.

But *practically*, in the use of *clays*, I have always derived a higher sperm equivalent per ton, and a heavier retort-product per day from 5 hour than from 4-hour charges; results which may be readily accounted for by the non-conducting character of the substance of the retort. Clays require a little rest to recover the heat abstracted by the coal vapors during the first 4 hours of the charge;—they do not regain a working temperature, nor transmit the heat of the reverberatory arch, so readily as irons do.

I have no desire to show a partisan or unfair spirit in these articles, and must state that (owing to their ready transmittal of heat) iron retorts deliver the greatest hourly yield during the first hour of the charge; whereas clays deliver the greatest hourly yield during the second hour. This is the result of a careful observation made by myself at the Savannah gas works many years since. I am aware that to any thinking mind this remark constitutes a powerful argument in favor of iron retorts, and I am frank enough to state that on account of their comparative absence of porosity, irons would be infinitely preferable to clays, but for the conclusive arguments in favor of the latter that their first cost is less, and that they are simply indestructible by any temperature which is applied in practice.

These articles are not intended to teach *the expert* anything; and he must excuse my going back to the A. B. C. of the matter while I explain to the beginner the exact idea of the "sperm equivalent" of the ton of coal, to which I have once or twice made allusion in t. is and preceding articles.

Discarding the matter of *purity* as unimportant to our present purpose, there are two elements of value in the gas product from any coal:—*volume*, being the number of cubic feet per ton—and *illuminating value*, being the candle-power of the product.

Now it is evident that a coal may afford an enormous yield in cubic feet per ton, and yet be worthless on account of the poor illuminating value of the gas; while it is equally evident that the gas may carry an enormous *percentage* of the hydrocarbon vapors, and yet be so small in volume as to be equally unavailable with the first named. To bring *both* elements into count is the purpose of the "sperm equivalent" formula which is obtained as follows:

The comparison is made in the photometer room between a gas consumption of five cubic feet,* and a candle consumption of 120 grains of sperm—each per hour. Now supposing that we find, by our station meter, that we are making 10,000 cubic feet per ton, while the photometer gives us an illuminating value of 15 candle-power, let us see what number of pounds of sperm will represent the amount of light obtained from the 10,000 feet of gas.

Five cubic feet of gas give us a light equal to 15 candles consuming 120 grains of sperm, therefore 5 feet equal 1800 grains of sperm. Then 10,000 feet of gas are equal to (5 : 10,000 : : 1800) 3,600,000 grains of sperm, which figure divided by 7,000 (the number of troy grains in a pound avoirdupois) gives us 514 2-7ths pounds as the sperm equivalent of the ton. Or, reducing it to an algebraic formula in which

a represents the candle-power.
b " " yield per ton, and
x " " sperm equivalent.,—

$$\frac{24\ a\ b}{7{,}000} = x$$

Or, in plainer language: *Multiply twenty-four times the yield in cubic feet by the candle power, and the product, divided by seven thousand. is the equivalent of the ton of coal in pounds of sperm.*

In regard to to the handling of men, the kindly instincts of the manager will serve as a better guide than any advice of my own. I have never seen a gas-work in which the subordinates were tricky or unmanageable in which the engineer was not wanting in one of three essentials—pluck, courtesy, or experience. The same remark, of course, holds good in the case of any manufacturing establishment.

Not very long ago, the Manhattan Company was using some Cape Breton coals which, as the engineers upon the Atlantic sea-board are aware, are very heavily charged with sulphur. So enormous was the disengagement of sulphur fumes from each purifying box when its cover was lifted, that the poor fellows employed in the purifying house actually bled from the ears, nose and mouth, and their eyes were completely injected with blood.

With a view of relieving his men, as much as from any other motive, Mr. Sabbaton attached air pipes, with suitable slide valves, to the bottom of each box, the pipes being carried home to a deodorizing exhauster—one of Farmer's new Helical Blowers, I believe. After changing a box, the cover was raised a half inch out of water, the slide valve opened below, and a powerful current of air drawn through the lime. In this way the offensive gases were picked up and blown through a pipe leading to the wharf, passed through a large auxiliary purifier in which spent lime was employed, and delivered from the top of a tall chimney-stalk.

The comfort of the purifying hands was, of course, at once secured; and nothing could be more touching than their affectionate regard for the engineer. I remember very well the buzz of approbation which went up *from* my stokers when they first made the acquaintance of the Malleable Iron Retort Lid.

It occurs to me that the following statement of the management of men in the admirably disciplined works of the Manhattan Gas Company, will be interesting to some of the managers of the great American companies. I publish it without comment, further than to state, that it exhibits that analytic quality which is almost as necessary to the engineer, as either of the three qualities named above—pluck, courtesy, and experience:

MANHATTAN GAS-LIGHT CO., N. Y. City,
Eng's Office, 18th St. Station, Mar. 12, 1868.

James R. Smedberg, C. E.,
Associate Ed'r Am. Gas-Light Journal.

Dear Sir: In reply to your favor of this date, I beg to communicate an extract from my personal note book, in regard to my division of labor. It is proper, however, for me to state in regard to the comments made upon the per centage of retorts disused for the purpose of scurfing, that in 1864 I was not speeding my exhauster so high as now; that by consequence my proportion of retorts blocked up with carbon is less, and my sperm equivalent per ton, is very much larger now than then. I am yours sincerely,

JOSEPH A. SABBATON,
Engineer Manhattan Gas Co.
November 22d, 1864.

Labor in Retort House.

1 Fireman to 10 retorts.
1 Luter to 80 retorts.
1 Coke wheeler to 30 retorts.
1 Barrow man to 50 retorts.
1 Coal man to 45 retorts.
1 Coal breaker to 130 retorts.
1 Yard man to 40 retorts

The above is based on the actual labor required while working 400 retorts at the Manhattan Gas Works, viz:

1 General Foreman,
3 Assistant Foremen,
40 Firemen, 1 man to two fires; they attend the fires, charge and draw, and clean the benches.
5 Luters,
13 Coke wheelers to wheel in the coke, take out the ashes, and clean up.
8 Barrow men to take out the coke.
9 Coal men to bring in the coal.
8 Yard men to dump the coke brought by barrow men.
3 Coal breakers to break the coal.

Working on the above system at Fourteenth street, it was found that the average time for charging three benches was, nay 23 minutes from the loosening of the first cottar bar to the screwing up the last one. The average number of retorts in each draw was 14.45 (the retorts out of action for scurfing being as 55 to 1500, or say 3 7-10 per cent. of the entire number heated); average charge per retort 234 lbs.; heaviest charge in five hours 260 lbs.; the smallest charge 214 lbs. The longest time required to charge was 30 minutes; the shortest time 15 minutes, varying according to the expertness of the gang. J. A. S."

In gathering up the lee-way which must unavoidably occur in chatty articles like these, I venture to make the following suggestion, that the strength of the skeleton piers is not sufficiently secured at present by the adoption of break-joint tie-blocks at vertical intervals of five or six courses of brick. Any engineer who handles a large stack, especially with the semi-elliptical arches, most suitable to sixes, must have noticed that by no possible combination of turn-buckles can he follow with sufficient accuracy the variable expansion of length in his stacks, due to the varying number of heated arches in it. The result is, at least so far as my experience goes, that it is simply impossible to secure sufficient strength to the intermediate piers by this device of tie-blocks. Now there are two available methods of dodging the difficulty, the first and the one that I prefer is this—have a pair of cast iron flanched clamps of sufficient length to enter and be completely secured by the concrete bench foundation, and at the same time to have their upper eyes centered 2½ inches above the level of the top of the stack, the face of the clamp to be 13½ inches in width, which width corresponds precisely with the thickness of each intermediate pier, which it completely protects from abrasion or damage.

Looking at this point of mine carefully, any engineer

* Except in the case of the pure cannel gases, the standard burner for which is a 3-foot fishtail.

will see that it is impossible that any burning off of the transverse tie rod can occur, it not being boxed up as was formerly the case; while, on the other hand by a simple calculation of strengths, the insertion of a turnbuckle and careful watching of the increased stress as each bed is heated, we obtain every possible element of stability for the piers. I do not seek to disguise the fact that the first cost of these heavy clamps must operate measurably against their adoption; but I claim on the other hand that $50 of iron work per bed is a trifling disadvantage compared to the noticeable stability which they will secure to one of the most sensitive features of construction.

There is another method of remedying this trouble, which any engineer may employ who prefers the tensile strength of brick to the tensile strength of wrought iron. It is the employment of dove-tail brick in the construction of the whole of each intermediate pier from foundation to saddle. Will not the engineers of the country advise me as to their coincidence or difference of opinion upon this important point?

Dr. Whitmore's Report

ON THE QUALITY OF THE GAS SUPPLIED IN ST. MARYLEBONE, IN JANUARY, 1868.

January.	*Mean of 27 Observations.	Illuminating Power in Sp. candles.		Mean Pressure in 10ths of an inch.		Mean amt. of Sulphur in 100 cub. ft.
		Highest.	Lowest.	Highest.	Lowest.	
Imp. Co.'s Gas.....	15.26	15.68	14.64	20.80	9.14	18.58
Chartered Co.'s common Gas.....	13 22	14.18	12.35	29.61	12.50	26.81
Chartered Co.'s Cannel Gas...	21.05	22.11	20.12	29.01	11.73	19.44

* Each observation consists of 10 readings of the photometer.

During the month of January the mean illuminating power of the Imperial Company's gas was equal to 15¼ sperm candles, or 27 per cent. higher than what is required by Act of Parliament. On four occasions only did it fall below 14 candles. This quality of gas—estimated at the price paid by the consumer for common or 12-candle gas, and which, it must be borne in mind, is the standard of illuminating power as fixed by law—is worth 5s. 1d. per 1000 feet, or, in other words, it reduces the actual cost of 12-candle gas from 4s. to 3s. 1½d. per 1000 feet. The pressure of this gas was fair, and as regards its purity the quantity of sulphur contained in it was within the limit permitted by law; there was no sulphuretted hydrogen, but traces of ammonia were usually detected. The mean illuminating power of the common gas of the Chartered Company was equal to 13¼ candles, and on no occasion did it fall below the standard. Its pressure was high, but as regards its purity sulphur was found in excess (taking the mean of three analyses) to the extent of nearly 7 grains in every 100 cubic feet of gas. This excess of sulphur has now existed for some months past, and it is high time that some means were adopted to get rid of it. On no occasion was any trace of sulphuretted hydrogen detected, but ammonia was always present. The pressure of the gas was very satisfactory. The cannel gas showed a mean intensity of light equal to 21 candles, or 1 candle above the standard. The sulphur contained in it was not in excess, there was no sulphuretted hydrogen, and not more than the usual traces of ammonia. Its pressure was very good. The above results were obtained from the gas manufactured by the Imperial Company at their Fulham works, and from the common and cannel gas of the Chartered Company at their works, in the Horseferry Road, Westminster.—*Lon. Jour. Gas Lighting.*

MAGNETIC PHANTOMS.—S. Meunier describes, in the Paris *Cosmos*, a plan for preserving a representation of the curious figures produced when iron filings are scattered upon a sheet of paper placed over a magnet. He saturates the paper to be used with a warm solution of ferro cyanide of potassium, and then dries it. For iron filings he substitutes pulverized magnetite or load stone, which is placed upon the paper and submitted to the action of a magnet. After a beautiful combination of curves, called the magnetic phantom, have been made, pure hydrochloric acid gas is brought in contact with the paper and figures, and, after a few seconds, removed. The paper, being then freed from the load stone powder, is washed very thoroughly; when dry a dark blue figure will show, with great delicacy of detail, the positions assumed by the pulverized ore under the influence of the magnet. The method is said to be more convenient and exact than the plan of covering the paper with a mixture of gelatine and starch, or paraffine and wax.

Purification of Gas.

[From "Clegg on the Manufacture of Coal Gas."—Fourth Edition.]

(Concluded from page 261)

The following observations by Dr. Lyon Playfair, in a lecture delivered before the Society of Arts, in January, 1852, deserve to be quoted, as showing the various useful purposes to which the residual products of coal-gas purification may be applied:

"The waste and badly-smelling products of gas-making appear almost too bad and fetid for utilization, and yet every one of them, chemistry, in its thriftiness, has made almost indispensable to human progress. The badly-smelling tar yields benzole, an ethereal body of great solvent powers, well adapted for preparing varnishes, used largely for making oil of bitter almonds, of value for removing grease spots, and for cleansing soiled kid gloves. The same tar gives naphtha, so important as a solvent of india rubber and gutta-percha. Coal-tar furnishes the chief ingredient of printers' ink, in the form of lamp-black; it substitutes asphalte for pavements; it forms a charcoal when mixed with red-hot clay, that acts as a powerful disinfectant. When the tar is mixed with the coal-dust formerly wasted in mining operations, it forms by pressure an excellent and compact artificial fuel. The water condensed with the tar contains much ammonia, readily convertible into sulphate of ammonia, a salt now recognized as being of great importance to agriculture, and employed in many of the arts. Cyanides are also present among the products of distillation, and these are readily converted into the beautiful color known as Prussian blue. The naphthaline, an enemy to the gas-manufacturer, by choking the pipes, may be made into a beautiful red coloring matter, closely resembling that from madder; this, by its transformation, promises an important, though hitherto not yet realized useful product. Coal, when distilled at a lower temperature than that required to form gas, produces an oil containing paraffin, largely used as an anti-frictional oil for light machinery."

It may be stated that naphthaline, produced largely when coal is distilled at too high a temperature, is olefiant gas in a solid state, and that the coal-oil mentioned by Dr. Playfair is this gas in a liquid state; so that this gas is alone gained in a uniform condition when a proper heat is applied.

The useful application of the spent lime from the purifiers is a matter of considerable importance in all works where that material is employed for the purification of gas. Much doubt has been expressed whether it can be applied with advantage as manure in consequence of its having sometimes produced prejudicial effects; but it appears from the investigations by Dr. Voelcker, Professor of Chemistry to the Royal Agricultural Society of England, that when judiciously used all samples of gas-lime increase the productiveness of land adapted to its reception, and that the instances of failure have arisen either from the application of such manure to land already containing a sufficiency of lime, or from applying it before it had been exposed to the action of the atmosphere to deprive it of the sulphur-compounds.

A valuable paper on the composition and use of gas-lime, by Dr. Voelcker, was inserted in the fourteenth volume of "The Journal of Gas Lighting," from which the following copious extracts are taken:

The successful application of gas-lime to the land depends, like that of marl, chalk, and quick-lime, upon a variety of conditions, some of which are peculiar to gas-lime. In order to guard against disappointment, it may be well to state at once that gas-lime is not a universal manure like farmyard dung, benefitting more or less every description of crop, on every variety of coil, nor that it is a concentrated fertilizer acting in a similar manner to Peruvian guano, nitrate of soda, or bone manures. In point of fact, gas-lime exercises a most decidedly beneficial effect upon some soils, but has no effect upon others; success in its application, therefore depends mainly on the proper selection of the land, upon which it is intended to be put.

In the first place, it will be desirable to inquire a little more closely into the chemical constitution of gas-lime. As already stated, the sulphur-compounds and carbonic acid in crude coal-gas transform the slack quicklime in the purifiers more or less into sulphuret of calcium, a combination of sulphur with calcium, the metallic base of lime, and into carbonate of lime. At the same time some tarry matter, a little ammonia, and other volatile substances, pass into the gas-purifiers, and are partially retained by the lime in a mechanical way.

Fresh gas-lime has a bad smell, arising mainly from the sulphur compounds contained in it, and should not be put on the land in this condition, for the ameliorating influence of a copious supply of air is required to transform these injurious sulphur-compounds into fertilizing materials, the presence of which, in some respects, renders gas-lime, exposed to air for some time, superior to quick-lime.

The oxygen of the atmosphere completely destroys the bad smell of fresh gas lime, by changing the sulphuret of calcium in it, first into sulphite, and finally into sulphate of lime, or gypsum. There is thus an essential difference between gas-lime, newly removed from the purifiers, and after it has been freely exposed to the atmosphere. In a fresh state it contains sulphur compounds, which give off sulphuretted hydrogen, and are injurious to vegetable life; in the latter condition it contains gypsum, a well-known fertilizing substance. The longer this refuse material is kept freely exposed to the air, the more completely these beneficial changes are effected, and the more efficacious it becomes as a manure.

In addition to the constituents already mentioned, gas-lime contains a variable quantity of water, more or less unaltered quicklime, and all the impurities originally contained in the quicklime employed in the gas works. In fresh gas-lime the proportion of water varies usually from 30 to 40 per cent.; in old samples there is much less.

The following analyses which I made some time ago, of a sample of gas-lime, kept long enough to be used with safety as a manure, will show at a glance its complex character:

Composition of Gas-lime (dried at 212° Fah.).	
Water of combination and a little organic matter	7.24
Oxides of iron and alumina, with traces of phosphoric acid	2.49
Sulphate of lime (gypsum)	4.64
Sulphate of lime	15.19
Carbonate of lime	49.10
Caustic lime	18.23
Magnesia and alkalies	2.53
Insoluble siliceous matter	0.28
	100.00

A glance at the preceding analysis shows plainly that the gas-lime acts as a fertilizer solely in virtue of the lime compounds which occur in it. Like quicklime, it discharges the four following important functions:

1. Gas-lime exercises a beneficial mechanical effect upon land, by rendering stiff, heavy clay-land more porous, friable, and consequently better adapted for cultivation, and by consolidating, on the other hand, light, sandy soils.

2. It supplies food to plants.—All our cultivated plants, on burning, furnish ashes containing a good deal of lime, which is essential to the healthy development of all vegetable produce. As plants have not the power of generating lime, it is clear either the soil upon which they are grown, or the manure which is put upon it, must contain a sufficient amount of this constituent, so necessary for the very existence of all plants. Gas-lime not only supplies lime to plants, but also sulphuric acid, a combination not present in any quantity in quicklime. For leguminous crops, such as peas or beans, for clover and other crops, especially benefitted by sulphate of lime or gypsum, gas-lime, when obtainable, as is generally the case, at a trifling expense, is certainly preferable to quicklime as a manure.

3. Gas-lime, in virtue of its alkaline properties, exercises a beneficial effect upon the organic matters in the soil. In this respect its action is similar to that of quicklime. Both facilitate the destruction of organic matters, the remains of previous crops, and their conversion into plant-food.

4. Gas-lime, like quicklime, has the power of unlocking, so to say, the naturally unavailable mineral stores of plant-food in the soil. In many soils, but more especially in clay land, we find portions of granite and other minerals, from which clay has been originally produced. These minerals are the chief sources from which the necessary amount of alkalies required by plants, is furnished. But as their decomposition proceeds slowly, a long time must pass before potash and soda can be rendered soluble, or made available for the use of plants. Gas-lime, like quicklime, materially hastens this decomposition, and thus produces an effect similar to that of a prolonged fallow.

These remarks on the functions of gas-lime, in relation to vegetable life, at once point out the crops which are benefited by the application, and, in a special manner, the kind of land upon which it produces the most striking results.

The crops which are particularly benefited by gas-lime, are—clover, sainfoin, lucerne, peas, beans, turnips and vetches.

It is also a most useful fertilizer for permanent pasture, especially if the land is naturally deficient in lime. On natural grasses, the best farmyard manure often produces little improvement until a dressing of lime, marl, or gas-lime has been applied. The latter more particularly destroys the coarser grasses, and favors the growth of a sweeter and more nutricious herbage.

Gas-lime also kills moss, heath, feather-grass, and other plants characteristic of peaty land, and is therefore a valuable means for improving peaty or mossy meadows.

For improvement of peat land, the liberal application of gas-lime cannot be too highly recommended. On such land it is best to use gas-lime in the form of a compost, which should be kept in a heap for a period

of ten or twelve months, and turned once or twice before spreading.

On land naturally deficient in lime turnips often refuse to grow, or if they grow at all, produce but a scanty crop, which is moreover very liable to be attacked by a disease known to practical farmers as "fingers and toes." A large dose of gas lime applied to the stubble land in the autumn, before it has been turned up by the plough, in many instances is an effectual cure for this disease.

With regard to the quantity of gas-lime which ought to be put on the land, no general rule can be laid down, for the quantity should be regulated by the relative deficiency in calcareous constituents which different soils exhibit Speaking generally, however, two tons per acre may be used with safety, and, in many instances, a heavier dressing will not be amiss.

The proper time for application is autumn, or the winter months, when vegetation is at a standstill.

On arable land gas-lime should be applied to the stubble, spread out evenly, and left exposed to the air before ploughing up for three or four weeks. On grass land it should be spread during the months of December and January, or, at any rate, before vegetation is making a fresh start.

In conclusion, I may observe, that it is well to remember that gas-lime acts beneficially as a fertilizer mainly in virtue of its calcareous constituents, and, therefore, is most usefully applied to land naturally deficient in lime.

On land abounding in this substance it has little or no effect. Though by no means a substitute for farmyard manure, guano, and other concentrated artificial manures, gas lime, judiciously used, unquestionably is a valuable auxiliary manuring agent, which frequently can be used with greater economy than quicklime or marl.

For conducting the purification of gas in small works very compact and convenient arrangements have been made by Mr. Bower, of St. Neots, and by Messrs. Holmes & Co., of Huddersfield, in which the condensers, purifiers, and scrubbers are all combined. The condensers are formed by the pilasters on the sides, the gas being make to traverse them them all in succession. Access to the interior of each pipe may be obtained by screw plugs, one of which is placed over each pilaster; and also by small hand-holes at each end, near the base. The washer, or scrubber, forms part of the inlet box, which is situated on the opposite side of the apparatus. The interior is divided by a partition into two compartments, so as to form two dry-lime purifiers, each of which is provided with appropriate sieves; and the covers are fitted with twin-buckles to hold them down, and with eyes for attaching them to the lifting gear. There is a valve in the centre, easily worked, for changing the direction of the gas through the purifiers. The condenser, base, and scrubber are each provided with an overflow pipe, connected with a dip cistern and with the tar well.

The Failure of the Magnesia Light.

We recently noticed the revival in France of the old scheme of applying the lime-light to the purposes of general illumination, by the introduction of a cheaper means of making oxygen gas. Notwithstanding it was proved by a careful examination of the new process of manufacturing oxygen, that under the most favorable circumstances that method of lighting would not bear comparison, in an economical point of view, with coal gas burned in the ordinary manner, the scheme was brought forward with so much pretension that it produced a panic among the holders of gas shares, the value of which were greatly depressed in consequence. To put the plan to a supposed practical test, it was proposed to institute a comparison between the effect and cost of lighting a part of the Place de l'Hotel de Ville according to the proposed scheme, and with ordinary coal gas. The result of the experiments is said to have been, that to produce an equal degree of illumination it cost exactly three and a half times as much by the Drummond light as by the combustion of coal gas in the ordinary way, though the amount of light given by the former was seven times more powerful. In the new application of the apparatus cylinders of magnesia are substituted for cylinders of lime. The experiments, after having been continued for about a month, have been suspended, for the purpose, as alleged, of making some alterations in the apparatus, but really in consequence of the failure to compete in cost with common gas. The timid shareholders in the Paris Gas Company are consequently recovering from their alarm, and the shares have almost regained their normal value. —*Lon. Jour. Gas Lighting.*

—The steam which is seen to issue from the spout of a tea kettle is no hotter, as measured by a thermometer, than the boiling liquid within; yet when condensed in a body of cold water or ice, it gives out as much heat as one thousand times its weight of boiling water would do.

Correspondence.

Clay Retorts.

EDITORS AMERICAN GAS-LIGHT JOURNAL:

Having received many letters from gas men, both East and West, asking for further information and results from clay retorts, your kind offer of the use of your valuable pages I accept, as one writing will do for all. I however do not wish it understood that I decline answering private enquiries on this subject; the only trouble is that I am not willing to do the mechanical part, viz.: the writing. I should be much better pleased to meet any of my brethren in the gas business, and spend a day talking gas than in writing to them, as iron sharpeneth iron, etc In regard to a meeting of gas men, allow me to give my cordial endorsement to the proposition for a Convention of gas superintendents and engineers this Spring at Cincinnati. We are satisfied that much good to all will be the result. We have met several superintendents who highly approve of the proposition, but who do not think it is necessary to endorse it; we think every one should do so by *writing to you*, and also by making up their minds to attend the Convention, and do what they can to contribute to the interest and utility of the proceedings.

In reference to the working of clay retorts and results therefrom, I trust we will be able to make ourselves understood. To obtain the best results, the heats must be high. You will never get clay retorts tight at any heat short of a light lemon, or what is better, a white heat. Let that be your standard; you need not be afraid of getting your heats too high. When you attain this standard the results will be satisfactory to you. Now, white heats is the standard we set up, although we do not always attain this; still, we endeavor to keep as near to it as possible; hence the results stated before. Some three months ago we had occasion to stop making gas for about eight hours. The dampers were closed and the retorts struck off, but not drawn. When ready to charge, the retorts showed a white heat. We charged one bench of fives with 2,000 lbs Yougioheny coal. Fifteen minutes after charging our station meter showed gas passage at the rate of 3,600 cubic feet per hour, and the charge was worked off in four and one-half hours. This is unusual working, but it shows what can be done with high heats. Many gas men think that when a retort shows a bright red heat when it is drawn, it is at a proper temperature for making gas. Let them put in a charge of 300 or 350 lbs. of coal, put on the lid and let it remain on for 30 minutes, then draw out the charge and see where their heat will be. Even with what we call dry coal the inside of the retort will be very much below the temperature it was previous to charging; and also far below that at which the richest illuminating constituents of the coal are converted into illuminating gas. All the experiments we have made (and they have always been made with the usual working apparatus) we have satisfied ourselves that the temperature of our retorts must be so high that the charge of fresh coal would not bring it below that at which the hydrocarbons' richest illuminating power would be allowed to pass to the tar well. We know a gas works where iron retorts are in use, and we hear that tar is plentiful, and plastic slate roofers say that it is easy to work in cold weather. We once were told by a stoker that it would take fire clay men to run our retorts; but to run those I refer to, men made of molasses candy (stiffened as it usually is with a little flour) would answer every purpose.

Now, with reference to getting up white heats, first see that your benches are properly set, and in this matter many superintendents have much difficulty from the fact that they are not practical men themselves, and cannot instruct a mason how to do the work Then in working some instruct their gas-makers, or stokers, to charge just so much weight of coal, and fire up just so often. This system of working we consider entirely wrong. For instance, should the day man leave his heats down, the night man has no authority to vary the weight of charges; he consequently charges as usual, and fires according to orders. Any man having a very moderate acquaintance with the principles on which the distillation of coal depends, will at once see the grave errors such a system of working must lead to. Yet this is the system practiced in many small works throughout the Union. Much depends on well set benches, but much also depends on intelligent firing and charging; for if a bench is not set entirely solid (and we have seen some nearly so) careful and attentive firing will seldom fail to get up good heats. As to the economy, that is another thing. You must see to believe the very imperfect condition in which many of the benches are in small works, both East and West. With a bench of threes in a 6 ft. 6 in. oven, two 25x15 and one 26x15, 9 feet long there is no trouble in making 20,000 cubic feet per 24 hours; in a bench of fives two 20x12, two 23x15 and one 26x15, 9 feet long, there is no trouble in making 35,000 cubic feet per 24 hours. We have sometimes made 40,000, and get over five cubic feet per lb. The retorts we use are from Brooklyn, late J. K. Brick & Co. We set them so that they will make gas up to the mouth piece. Our front walls are one brick thick, with joints broke both vertical and horizontal. We frequently had trouble with our mouth-piece bolts burning out; but since we adopted the plan of running them into the retorts with plaster-of-paris, we have not had so much trouble. We always use a bolt carrying two nuts; the inside one is $1\frac{1}{4}$x$1\frac{1}{4}$x$\frac{3}{8}$; these we drop in the hole, screw in the bolt, then carefully bed them with fire-clay, and draw them up tight with the outside nuts through a template, the duplicate of the mouth-piece flange. There are recesses on the inner face of this template, at each bolt into which we pour the plaster, which runs in and covers it to the thickness of $\frac{3}{8}$ of an inch from the back nut outwards. The retorts are set in their places before putting in the bolts; then put them in and build up the front walls. Our mouth-pieces weigh 200 to 205 lbs., and have 6-in. openings for stand-pipes. When putting them in we prick the front of the retort with a sharp tool, then with a white-wash brush soak them well with water. This prevents the cement from setting too rapidly, giving plenty of time to screw up the bolts. When this has been done turn your mouth-piece flange up, put on cement, then turn it flange to the retort, and hoist it to its place, taking care not to allow the weight of the mouth-piece to come on the bolts till they have been screwed up tight.

The cement we have used for years is finely sifted iron borings, one part clear sharp sand, and with just sufficient clay to hold them together. This we mix as required with a solution of sal ammoniac in water, say one-half pound to five mouth-pieces. When the bolts are all drawn up we finish carefully with a small trowel. The outside and inside of the joint, when the bench is hot enough to charge, we put a little oil on each bolt, then with a socket wrench try each nut, using your judgment as to how tight they will bear without cracking the retort. Before firing up an old bench, we always go carefully around the mouth-piece joints inside and outside with a wash made with water and the loam we use for our lids. We use the same for tightening up leaks in the mouth-piece joints, when the retorts are at work putting it on with an old white-wash brush Our first charges in either new or old retorts is the finest coal we can find, with about one pail of tar to 150 lbs. of coal. One or two charges of this will tighten very leaky retorts, provided always that your *heats are high.* To facilitate the removal of carbon from the back end of the retorts, we put in what we call a false end about two inches thick. It is composed of coarse brick with sufficient loam or common clay to make it plastic. This we roll in balls and throw into the retorts, then with a ptece of boiler iron 12x8, and of the form of the retort fastened to the end of a 1-inch pipe, we keep ramming the mastic till it spreads evenly over the back. The retort must be hot when this is done, or the mastic will not stand up. When the carbon is to be removed, the false end not being solid, it is easy to cut it through either vertically or horizontally; its removal is then comparatively easy. The false end is also a good way to repair the back end of a retort that has been broken by using the cleaning-bar incautiously. It is our experience that the higher the heats the less carbon, and what does collect is easily removed. As J. R. S. advises, get plans of a good setting where good heats are worked. Then see that your works are clean and large enough to pass the gas you are making without giving more than your gasholder pressure on your retorts; you can always tell what you are doing if you have a pressure guage on your hydraulic main.

We may give your readers, in your next, our experience in repairing clay retorts while working. It is sometimes valuable to know how to do this, especially where all the retorts working are required.

OUT WEST.

Smedberg's "Synopsis of Gaslighting."

WASHINGTON, D. C, March 3, 1868.

James R. Smedberg, Esq.

Dear Sir: I see with pleasure that you purpose publishing a "Synopsis of Gas-Lighting" by consolidating the most valuable and interesting portions of the London *Journal of Gas-lighting*, and other useful information. A work of this character cannot fail to be of great value to gas engineers; and your familiarity with all pertaining to the management of gas works makes you especially qualified for the execution of so important a work. You will be kind enough to put our company down for three copies, with my best wishes for the most complete success of your undertaking.

Yours very truly, GEO. A. MCILHENNY,
Engineer Washington Gas Co.

BOSTON, Mass., March 3d, 1868.

James R. Smedberg, Esq.

Dear Sir: * * The London *Journal of Gaslighting* is the great repository of our specialty, and I suggested to Mr. Barlow, some years since, the importance of publishing a suitable index to it. Indeed, every gas engineer must provide, for his own convenience of

speedy reference, a short manuscript index of his own.

I hope that it comes within your plan to include a tolerably full index to the 16 volumes *

At all events, a selection and comparison of its more important articles will be valuable to the profession, and I am glad that you have taken the matter in hand. Will you please include my name among your list of subscribers and oblige, Yours truly,

W. W. GREENOUGH,
Treasurer Boston Gas Co.

* This index will be published as an appendix to the Synopsis.

NEW YORK, March 6, 1868.

James R. Smedberg:

Dear Sir: Please place our firm upon the subscription list to your "Synopsis of Gas-Lighting" for 2 copies. The book will be very necessary to every one engaged in the furnishing of iron-work and other supplies to gas companies, and we personally know you to be the proper person to get it up. Very truly,

HERRING & FLOYD, Oregon Foundry.

CINCINNATI, March 9, 1868.

James R. Smedberg, Esq.

Dear Sir: Please consider the Cincinnati Gas-Light Company a subscriber to your "Synopsis of Gas Lighting." The value of such a work to those in the profession is beyond question, as is also your ability to perfect it. It will give me pleasure to facilitate its success. Yours truly, H. J. MILLER,
President Cincinnati Gas Co.

The following additional subscriptions are acknowledged, making 101 in all.

W. W. Greenough, Treasurer Boston Gas Company.
William Combe, Supt. 14th st. station Manhattan.
A. M. Smith, Clerk, " " "
John Fullager, Foreman " " "
Maurer & Weber, New York City.
Carl Shultz, Ass't Chemist U. S. Assay Office.
Erie Basin Iron Works, Brooklyn, N. Y.
Herring & Floyd, Oregon Foundry (2 copies).
Washington Gas Company (3 copies).
George D. Cabot, Agent Lawrence (Mass.) Gas Co.
A. C. Wood, Sup't Syracuse (N. Y.) Gas Co.
Henry Holdrege, 25 Pine street.
Murray, Baker & Walker, Fort Wayne, Ind.
Cincinnati Gas-Light Co.
Armstrong & Blacklin, cor. Court and Union streets, Brooklyn.
Henry A. Stuart, 135 East 26th street, N. Y.
American Meter Co. (2 copies additional.)
Samuel Down, Esq., New York City.
J. B. Howard, Lessee Dubuque (Iowa) Gas Works.
American Gas-Light Journal, 50 copies.
E. M. Perkins, Office Am. Gas-Light Journal.
Williamsburg Gas-Light Company.
Hiram Merrill, Supt. Janesville (Wis.) Gas Works.
R. A. Brick & Co., Bergen Iron Works.
Thomas J. Earle, 512 West 22d-street, New York.

The Proposed Convention.

ROCKFORD, Ill., Feb. 27, 1868.

James R. Smedberg,
Office AMERICAN GAS LIGHT JOURNAL:

Dear Sir: * * How does the proposition for a Convention of gas men prosper? We need one very much more now than we shall in a year or two, as things are in a transition state from war to peace.—Prices, freights and supplies are very high; and if the parties interested do not make an effort, who will? Other business men have organizations for their mutual benefit;—why should not we? Yours respectfully,

THOMAS BUTTERWORTH,
President Rockford Gas Co.

BRIDGEPORT, CONN., March 10, 1868.

Messrs. Editors: It must not be said that I do not approve of the Gas Engineers' Convention, for I heartily endorse it; but at the same time it strikes me that there is no better place than the city of New York, for our great lights are in that city. I have my doubts about their coming out to aid and assist the lesser lights. It would benefit us to a great extent and should be held once a year, if not oftener. *Convention by all means.* Yours truly.

C. A. GERDENIER,
Sup't Bridgeport Gas Works.

CIRCLEVILLE, Ohio, March 7th, 1868.

Messrs. Editors: The proposition to hold a Convention of gas engineers and superintendents of gas-works cannot fail to be productive of good results to the entire profession, if cordially entered into. It cannot be supposed for a moment that any one man has obtained perfection, either in the manufacture of gas, or the construction of gas-works. Hence it might be, that the most humble in the ranks will be able to impart some portion of truth and experience that will add to the knowledge of the most profound and experienced. I would therefore heartily endorse the call, and ratify the suggestion of some of your correspondents in naming Cincinnati, where one of the best managed works of the country exists, as the proper place of meeting.

Truly yours, R. T. COVERDALE.

PITTSBURGH, March 11th, 1868.

Messrs. Editors: Our Mr. Wilson has just returned from a Western trip, and all the gas engineers he met, with only one or two exceptions, are in favor of the Convention of gas engineers, etc., to be held at Cincinnati, Ohio, which we understand you are discussing in the columns of the Journal. The majority of them requested him to write you on his return, and get you to issue the necessary call for one, to be held in May, and they would attend. He spoke to them personally on the subject, and they are very anxious to have some one move in the matter, and say that is all that is required to make it a success. Very truly yours,

WILSON & GARDNER,
Westmoreland Fire-Brick & Clay Retort Works.

KANSAS CITY, Mo., Feb. 17th, 1868.

MESSRS. EDITORS: We have a new and well-constructed works, which reflects credit upon the proprietors, Messrs. Pratt and Hart They were built under the supervision of the long-experienced and well-established engineer, Mr. Thomas Pratt, of St. Louis.

Our connections are all of 8-inch pipe; three benches of retorts (one running); the retort house is of sufficient capacity for 10 benches; large scrubber and washer: complete set of 8-inch condensers; 3 purifiers 6x12; tank 20x50.

We get coal from California Station, Mo.; about two miles of street mains; 100 consumers; 55 public lamps, with a flattering prospect of extensions this spring.

Charge for gas, $4.50 per thousand. CHAS H. BOYLE,
Superintendent.

Report on Materials for Apparatus for Gas Works.

BY J. LAWRENCE SMITH.

United States Commissioner and Member of the Superior Council of the Exhibition at Paris in 1867.

RETORTS AND FURNACES.

These are the first and most essential parts connected with gas-making; and the present Exposition is rich in specimens of these from various countries. In the Belgium department, we have the fire-brick, tiles and retorts from "La Societe anonyme des terres plastiques et produits refractaires d'Andennes," a company employing nearly 20,000 tons of clay annually, requiring about 220 men, and having 32 large kilns. Among the articles exhibited by this company are very large retorts, one of which is over ten feet in length and two feet across, with an opening of about seventeen inches, and two inches thick; it weighs about 1,700 pounds, and is of most excellent manufacture, which is equally true of all other articles exposed by the company. Near the above are to be found the retorts of Sugg & Co., of Ghent, who supply, to a very large extent, the gas works of Germany. From Prussia, there are excellent products of fire-clay, made by Vygen & Co., of Duisburg, and used in Germany, Holland and Switzerland. England is represented by the well-known products of Cliff & Son.

France furnishes retorts and gas ovens of excellent quality; there are several exhibitors, but none are so conspicuous as those from Bosquet & Co., Lyons, and from the Paris gas company. The retorts from the former establishment are covered with a kind of black enamel, and are set in the gas ovens by being simply supported at the two ends. Without farther investigation, I should doubt the advantage of this style of setting; its simplicity may be too great a sacrifice to its security.

There is, however, no establishment so thoroughly organized or confining itself strictly to the refractory materials necessary for gas ovens as the Paris gas company, about which it may be well to make a few detailed statements, as the plan of operation of this company might be advantageously followed by other large companies. The works of this company are at La Vilette, a place most conveniently located for the purpose, as railroad and canal communications bring all the necessary materials to this point, and it is on the same premises as the extensive gas works of that locality. It has been established since the consolidation of all the gas works of Paris, about 12 years ago, and it furnishes retorts and other refractory materials required by the different works in Paris and in many other parts of France. The mills, mixers, &c., are set in motion by a 40 horse-power engine; but all the manipulations, after tempering the clay, are performed by the hand, requiring about forty men for the purpose, as no machinery has yet been devised to replace successfully the use of the hand in giving the necessary uniformity of consolidation to the plastic material employed in making the retorts and the large tiles, that are constructed by compacting together in small lumps the material, using for that purpose the blows of an iron hammer or wooden mallet.

The articles manufactured at the Paris gas works annually are:

Retorts	3,000
Blocks and tiles	20,000
Bricks	1,000,000

All the burning of the above in accomplished in furnaces heated by coke.

It is an interesting fact connected with this establishment that there is no refuse rejected; for even the ash of the furnace is used to make a tile for the floors of its own workrooms, and their excess is sold outside for similar purposes, for stables, &c. The ashes are mixed with a cement that consolidates them—about fifty per cent of ashes being used.

Among the articles exhibited by this company are large pieces of refractory materials—one of a perfect tube ten feet long and forty-three inches in diameter, and one solid mass of eighteen tons for the floor of an oven. There is a small model of their gas oven complete, with retorts, &c.

In the above statement in regard to gas retorts there is nothing new that has been developed in the past five years. It simply shows that the old iron retort, originally used, is more and more thoroughly excluded than ever from gas works; for, while a clay retort may require a little more fuel than an iron retort, this is more than compensated for by its original cost and durability, and the possibility of using a higher temperature, one better adapted to the generation of gas, viz., 1200°, which cannot be employed with an iron retort.

As regards the manner of setting the retorts in the ovens, different plans are proposed by different engineers, each having their advocates. In London, gas ovens are often made with ten retorts 18 feet long and open at both ends, each retort being composed of three pieces. In Paris, the retorts are of a single piece about 9 feet long and open at each end, and in each oven there are six retorts. We understand that in London there is a tendency to give up the ten retort system, and not to exceed six or eight to an oven; regularity of temperature and facility of emptying the retorts would recommend the latter.

CONDUCTORS OF GAS FROM THE RETORTS, CONDENSERS, ETC.

Under this head we obtain no new suggestions in the present exhibition. In the gas works visited, all the conductors of the older parts have been too small, their dimensions being based on calculations made in reference to gas unmixed with thick, condensible vapors in suspension. This is, however, avoided in all new constructions. In some works, instead of an hydraulic main to every row of benches, only one is used for those ovens worked back to back, this being placed in the centre line, the hydraulic main being constructed of sheet iron three-eighths of an inch thick, to avoid risk of breakage from irregular settling and expansion. All these points are worthy of consideration. In condensers there has not been any striking or useful novelty in recent years, and nothing at the exhibition suggests any.

METHOD OF HEATING THE RETORTS.

All that is novel under this head is the application of Sieman's Gas Oven and Regenerative Furnace to this purpose. There is a model of this furnace in the Exposition, and, as its application is of a general character and is already well known, I leave to other reporters all that is to be said concerning it. As regards its applicability in heating gas retorts, this has been successfully carried out at the Vaugirard gas works, at Paris, and the gas works in Birmingham, England.

The experiments made at Vaugirard were with a single generator applied to heat sixteen ovens of eight retorts each, and there has been found a saving of from 22 to 29 per cent of fuel, and the results have been sufficiently satisfactory to encourage the Paris gas company to adapt it to other works when needed to be refitted.

PIPES FOR DISTRIBUTING GAS.

In several of the classes there are exhibited pipes for this purpose. There are cast and wrought iron pipes, bitumenized paper pipes, bitumenized sheet iron pipes, copper, lead, brass, vulcanized caoutchouc, and a new material, called parkesine, in the English department. As most of these pipes will be reported on by others, only a few remarks will be made with special reference to their use in gas distribution. Cast iron pipe is still used in most countries for the dittribution of gas through cities. In France, however, they have been more or less abandoned, although it is a question if this can be done advantageously.

The exhibition of cast iron pipes from the various countries is certainly magnificent, but the beauty of the French castings is not excelled and rarely equalled. There are some new plans proposed for joining the pipes—one by M. Marini called the universal joint, made with rings of caoutchouc and cast iron bands, but it is doubtful if any joint made with caoutchouc is to be relied on for any length of time where gas is to be

conducted, and where naphtha and other condensible products will be constantly acting on the joint.

WROUGHT IRON PIPE.

The specimens of these pipes on exhibition merit a special notice by the proper reporter on the subject. Those intended for conducting gas have no special merit beyond those of former expositions. The use of those pipes in conducting gases through houses is very limited in France compared with their similar use in England, America, and other parts of the world, lead and composition pipes supplying their place. Other purely metallic pipes used in conducting gas present nothing novel. The specimens of lead pipes show to what great perfection their manufacture has been developed, and there seems to be no limit to the length which can be given to a single pipe. One specimen on exhibition is 8,000 feet long

Caoutchouc pipes show no improvement in quality of composition. They are all permeable to gas, which defect can, however, be more or less perfectly remedied by two or three coatings of boiled linseed oil, applied to the external surface, a precaution that will render the use of this conductor, especially in chemical laboratories, less offensive. *Parkesine* is an artificial composition for gas pipe, and is said to substitute advantageously caoutchouc. It is to be found in class 44 of the English department, and is said to be made of gun cotton and other chemical compounds. *Bituminous pipe* is on exhibition, and recommended for conducting gas. It is stated that it is used in some places for this purpose; but the well known action of certain of the constituents of gas on bitumen would naturally militate against its use.

BITUMENIZED IRON PIPES.

Under this head there are gas pipes exhibited by Messrs. Chemeroy & Co., of Paris. While these pipes are no recent novelty, yet they deserve especial notice, as the manufacture of them has received during the past few years a wonderful extension, for the purpose of conducting water, as well as gas. The base of the pipe is sheet iron leaded, varying in thickness according to the required size and pressure; each section of pipe is made of two sheets, that are first riveted together separately with tinned rivets, and plunged into a bath of melted lead; these two pieces of pipe are then riveted together, and the junction of the two well tinned. The entire pipe is now thirteen feet long. On the ends are cast convenient sockets and spigots, made of a mixture of lead and antimony, and these serve to unite the sections of pipe when laid in the ground. The exterior surface of the pipe is coated with tar, and around this is wrapped a cord; this cord is then covered with melted pitch, and the pipe then rolled in coarse sand until it has acquired a thickness of from one-fourth to five eighths of an inch.

In attaching a service pipe to these pipes when used as main pipes, it must be done by soldering a lead or composition service pipe to the main, in order to make a good and effective junction.

It is impossible for the reporter of this article to pass a correct opinion upon the merits of this pipe as a conductor for gas. In lieu of this, a statement will be made of the statistics of the products of the works of Messrs. Chameroy & Co. In one year were made 155 miles of pipe for gas from 1¼ to 28 inches diameter; the Paris gas company have in ten years laid 436 miles of these pipes. In the Exhibition building there is nearly one mile from 12 to 24 inches diameter, and since the foundation of the establishment in 1838 the products of the works have been as follows:

France, for gas	2,577	miles.
" for water	664	"
In other countries, for gas	583	"
" " for water	233	"

Entire value of the above, $7,708,400.

EXHAUSTERS.

For many years the adaptation of exhausters has been considered a matter of economy in all large gas works; but, more especially since the introduction of clay retorts, they have become an absolute necessity. There is nothing new exhibited in the way of improvement in gas exhausters, and the opinions of engineers are still divided between the use of exhausting cylinders and rotary exhausters. Schiele, of Frankfort, exhibited a rotary exhauster said to work well, and very economical in its original cost. In Paris, an exhauster with three cylinders, devised by M. Arson, is employed in the gas works. One of these exhausters has been for eight years in continual use. Brochi exhibited one consisting of three small gas-holders, with their bottoms plunged in tar, and worked alternate by one of Hugon's gas engines.

GAS METERS.

We find on exhibition both wet and dry meters. The wet meter is the one most commonly in use on the European continent. In France there are but few dry meters employed, and consequently there has been a good deal of attention given to the improvement of the wet meter.

One of the modifications of this meter as made by the celebrated manufacturers, M. M. Brunt & Co., is that the "Syphon" and regulator are bent in a vessel having a vertical tube which enters the waste water box. This tube is separated by a diaphragm from the inside of that box, on which the spindle of the drum turns; the meter thus fulfills the following conditions, prescribed by the administration of gas in Paris and other parts of France:

"The examiner, having left all the orifices of the meter open, shall ascertain that the float, the syphon, the hydraulic seal of the vertical shaft, and the inlet pipe for the water are water-tight, under a pressure of at least 4 inches."

Other French exhibitors, as Messrs. Siry, Lizars & Co., and M. J. Williams, show most perfect workmanship in their apparatus, the latter manufacturers paying a great deal of attention to testing apparatus. Almost every European nation is represented by gas meters; and England, the greatest of all gas consuming countries, is, as might be expected, fully represented with everything in the way of meters, both wet and dry, which are active competitors for the ascendency in England. The dry meters of M. M. Geo. Glover & Co. are as complete as they can be made, with our present knowledge, and are world-renowned for their accuracy and durability. The wet meters of the Globe Meter Company are well arranged for adjustment of water level, and are said to require adjustment but once a year. There are other makers who arrive at the same end by different means.

The compensating meter of Messrs. Sanders & Donavan, of Dublin, accomplishes this by an independent compensation float, not interfering with the machinery of the apparatus. In the articles exhibited by the gas meter companies of London, Oldham and Dublin, there is a pressure generating meter, in which a spring or weight, as in a clock movement, is made to increase the pressure, a desideratum in some instances where the street pressure is not sufficient. The first meter to which is attached the movement draws in gas say into a ten-light meter; from this it passes to a ten-light dry meter, and then through a five-light meter of variable level.

Many of the English meters are now made with cast iron outer casing instead of tin plate. There are various large station meters exhibited that have all possible care bestowed on their construction, but there is no novel feature in any of them worthy of special mention.

(To be concluded in our next.)

PATENT CLAIMS.

Pertaining to Gas, Mining, Petroleum, Water, etc.

75,057—STEAM GENERATOR.—Sylvanus Sawyer, Fitchburg, Mass.

I claim the combination of the detached fire-box, the steam drums or chambers, and the main boiler, arranged substantially as described.

75,121—WATER WHEEL.—N. F. Burnham, York, Pa.

I claim the combination of the curved chutes, s s, when constructed with curved walls near the outer extremity, in the manner described and shown, with the gate ring B, surrounding said chute, and having the openings, r r, the whole device operating to receive the water in a direction toward the center of the wheel, and turn it by the concave wall until it is thrown in a compact mass against the buckets, tangentially to them, in the manner described.

75,225—WATER METER.—Franz Wagner and Louis Sexaur, New York city.

We claim, 1st. The oscillating valve, E, with chambers, n n, and ports, o o' p p' in combination with the reciprocating piston, B, stops, k k, toggle-arms, d' f, spring lever, c, and elbow lever, d d', all constructed and operating substantially as and for the purpose described.

2d. The combination of the valve, t, bolt, u, and plug, I, in the mud cistern, H, substantially as and for the purpose set forth.

3d. The channels, s r, in combination with the supply pipe, G, mud cistern, H, substantially as and for the purpose set forth.

COAL MINES IN THE PACIFIC STATES.—During the last year the only coal mines worked within the limits of the Pacific territory were those of Bellingham Bay and Monte Diablo. The amount extracted from the former was 8,816 tons, and from the latter 71,322, making a total of 80,138. This amount is rather small and exhibits an unhealthy decrease when compared with the preceding year, the product of which was about 90,000 tons. The two principal companies at Mont Diablo have increased their facilities of transportation to tide water by the construction of railroads, which it is expected, will be attended by beneficial results to the consumer.

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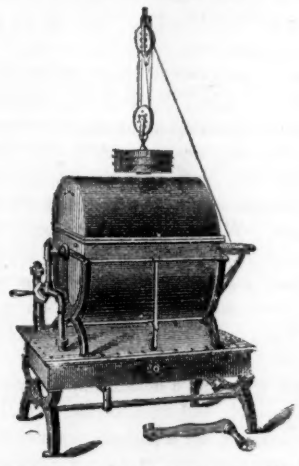

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Yours respectfully,
WM. C. BARNES.

BOSTON, Aug. 22, 1867.

MESSRS. O. P. DRAKE & Co., 8 Bedford-st., Boston:

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Yours respectfully
W. E. PLUMMER,
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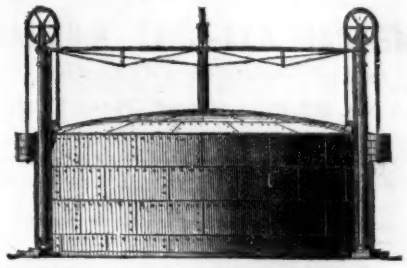

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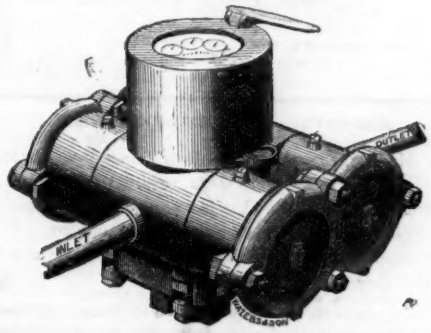

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M. L. CALLENDER & CO.,

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MONDAY, MARCH 16, 1868.

WISHING TO MAKE this Journal an organ of intelligent discussion to those of our readers who may wish to gain or give information on the subjects to which its columns are devoted, the publishers solicit letters from all among them who make the study of those subjects a pleasure, or a profession.

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Answers To Correspondents.

TO MANY CORRESPONDENTS.—It is impossible for Mr. Smedberg to reply to some very flattering letters, from the fact that he has just accepted the Engineership of the San Francisco Gas-Light Company. The Company works under a capital of $6,000,000, out of two very heavy station-works.

C. A. G., Bridgeport, Conn.—You will find the question of the periods of charging discussed at some length in the "Practical Management of Gas Works." Your gain of 4½ per cent. in yield per ton by charging on the 5-hour system certainly proves that the thing is so;—*why* it is so, the articles are designed to explain. It is easier for your men, and more satisfactory to yourself to adopt 5 hours as the standard, and by making out, each Monday, a schedule for the week, it will be impossible to make any mistake about the times of charging, which, of course, vary each day from the preceding. If you reduce your charges to 240 lbs. of coal to the retort, you will, almost certainly, run your ton-yield up to 10,000 cubic feet, (4.47 per lb.), and that is a good enough result for any man on earth who does not run an exhauster. Over charging of the heats is a most serious and common error in retort-house management; and one which Mr. Smedberg, for whom you seem to have such respect, has committed as often as any one else. Get 10,000 cubic feet from the ton of first class caking, and *after that*, take as much over 5,000 feet per day out of each retort as you can. Hughes and Colburn only give the *English* practice, which varies in some important points from our own. If you have any respect for stubborn historical facts, do not stultify a friend of yours by calling 5-hour charging *his* "system"

—That very industrious technical chemist, Dr. R. Wagner, says that the disagreeable odor of petroleum oil can be taken away by treating the oil with a solution of plumbate of soda. This is only a solution of oxide of lead in caustic soda, and will certainly remove all such odor as sulphur compounds might communicate to the oil. How far it may affect other smells we cannot tell without experiment.

—When very strongly heated, soapstone or steatite, loses a portion of its compound water; it becomes harder, and susceptible of taking a polish. It is used in this form for gas burners, for which it possesses many advantages, neither corroding nor burning out.

GENERAL TOPICS.

We are constantly receiving letters from the country which convey inquiries as to the most rudimentary principles of gas-lighting. This spirit of investigation, we are glad to observe, is upon the increase; we only regret that the pressing nature of our labor has prevented our noticing it more carefully. And it is with view to a general chat with the superintendents of small works that we publish this editorial rather than write fifty letters.

There is, in many cases, much truth in what our correspondents say about being overworked. When a man has 300 meters to set and attend to—services to lay, and posts to erect—the works to handle—defaulting consumers to watch—and all upon a very small salary, he absolutely *cannot* find time for study. We, personally, have been through this mill completely enough, and while knowing it to be a necessary school for the handling of large works, are persuaded that companies do not treat those who wield their whole fortunes, with sufficient consideration.

We have in our mind a dozen men who only need a dozen books each, and time to read them, to make first-class managers, but who have no money to buy books with, and therefore let their works run along, as if by accident—knowing nothing of the improved methods which are being adopted all about them, and chafing all the time under the consciousness of an ignorance for which they ought not to be blamed.

Every book on gas-lighting which such an one reads acts by double effect to increase his efficiency: *first*, he really learns something; *second*, his ambition is stimulated by his finding out how much yet remains for him to acquire.

Now these are *facts*:—how can any company, however small, decline to provide its superintendent with a small and inexpensive set of reliable books, so as to improve *his* education and, by consequence, *their* dividends?

Take these books, for instance, Mr. President; put them into the hands of your honest and faithful, *but poor*, superintendent, and see if he don't save money for you in the course of a twelve month:

Hughes on Coal Gas	Price,	$1 50
Colburn's Gas Works of London,	"	0 75
Bower's Gas Engineer's Book of Reference	"	1 00
Galloway's First Steps in Chemistry	"	3 25
Haswell's Hand Book	"	3 00
Baker's Practical Mechanism	"	1 50
Clegg on Coal Gas	"	10 50
Smedberg's Synopsis of British Gas Lighting	"	15 00
		$36 50

(Any of the above publications may be obtained from D. Van Nostrand, 192 Broadway, or at our office.)

There are, of course, many other and very expensive works which are indispensable to such advanced students of gas lighting as are in the conduct of large works; but those just named suffice for the every-day instruction of the beginner.

For the trivial outlay of some thirty-five dollars, then, every gas company can place within reach of its officers a full and complete library of reference.

To say, "So and so is a practical man; he does not need books," is all nonsense. No man living *can* be practical who does not study the excellence and the errors of his brethren, and these are only to be found in books. We have in our mind some half-dozen of the most ludicrous blunders (and blunders very expensive to their employers, too,) made by superintendents who possessed every other necessary trait except a little culture. We know of a case within a week in which the substance of a single sentence in an article published in another column, is operating to save a very small company between $900 and $1000 per annum.

We know of a company whose officers are immensely satisfied with 8000 feet from the gross ton of first class caking coal, while they would secure a gain in gas-yield of 2000 feet per ton by only a little study and reflection.

Instances of the sort come every day to our knowledge. We have been through all this ourselves.

A man's mind becomes more receptive with every atom of additional knowledge which he gains.

Now, the superintendants of small works are, as a general thing, too poorly paid to buy even this little collection of books. The prime necessities of bread and butter, and such, deprive them of the *power* of improving themselves by books, however strong may be their *desire* of so doing; and it is a most miserably short-sighted policy on the part of any company to deny a faithful servant the means of an improvement in knowledge, which *must* react to their own far greater benefit.

It will be noticed that we include the "Synopsis of British Gas Lighting" in our list. We have proved our faith in the work by subscribing for 50 copies of it; because we are certain that it will be the most remarkable and complete epitome of practice ever published in any art; and because, also, we wish to redeem the gas managers of the country from the shame of suffering the enterprise to lapse for want of support.

THE PROPOSED CONVENTION.

We are constantly receiving letters from the gas world (particularly in the West) urging us to advocate yet more strongly the Convention of Gas Engineers. We have devoted a good deal of space in our columns, and a good deal of valuable time, to the advocacy of the plan, and confess our disappointment at the meagreness of the response received. Why will not every gas company in the country vote "yes" or "no," and let us consolidate and publish the result? We are pledged to the cordial advancement of the scheme, but are simply powerless to *compel* those most interested to take action, either in one direction or the other.

We publish in this issue a lengthy advertisement of the firm of Murray, Baker & Walker, Gas Contractors, of Fort Wayne, Ind.

Mr. Walker's "Out West" letters have made him more favorably known than any comments of our own can do; and we wish his associates and himself every success in the connection they have formed.

FOR SALE.

A COMPLETE SET OF FOUR PURIFYING Boxes, 5 feet diameter, with four large wooden Trays, Centre Seal, and 48-inch Station Meter, with 6-inch connections, also a set of 6-inch horizontal Condensers. Apply at the office of the Elizabethtown Gas-Light Company, Elizabeth, N. J. 197

SITUATION WANTED.

A MANAGER OF SIX YEARS' EXPERIENCE desires a Situation with some Gas Company of moderate size. He is a practical Gas-fitter, and familiar with accounts, and can furnish satisfactory references. Address R. H., care AMERICAN GAS-LIGHT JOURNAL. 197

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This work will comprise the essence of the London *Journal of Gas Lighting*, from February 10, 1849, to December 8', 1867, and afford a succinct resume of the entire English Gas Engineering between these dates.

The excerpts will, as far as possible, be symmetrically arranged under the heads of Coals, Distillation, Purification, Volumetry and Photometry.

It is to be executed by JAMES R. SMEDBERG, C. E, (Associate Editor AMERICAN GAS-LIGHT JOURNAL, 22 Pine-street, New York city, to whom subscriptions should be addressed. It will be issued only to subscribers.

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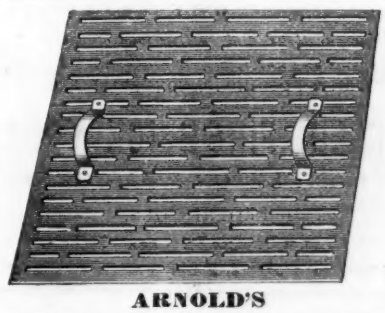

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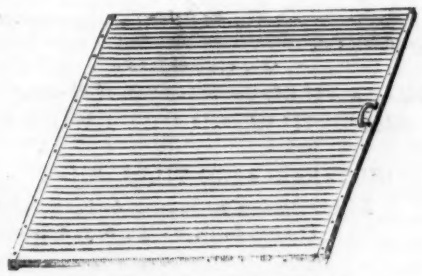

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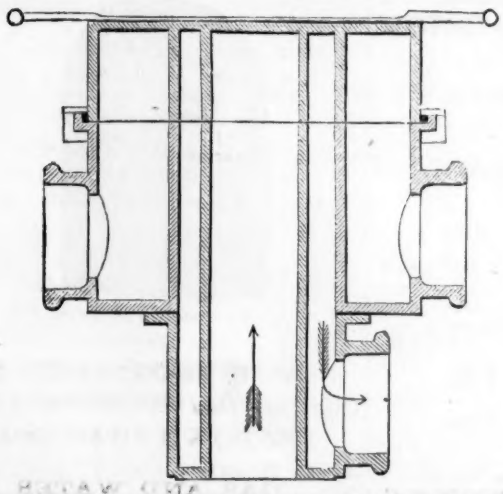

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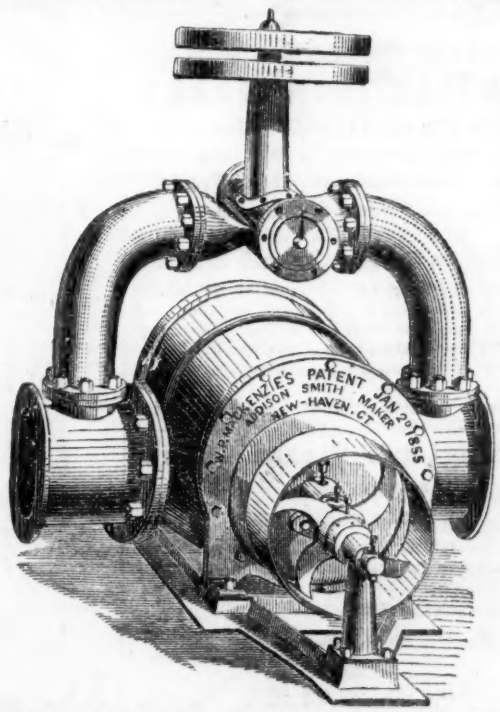

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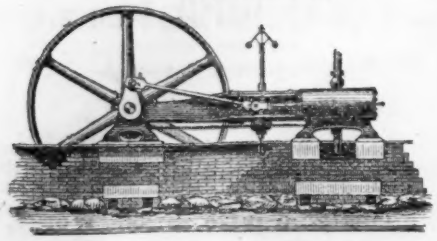

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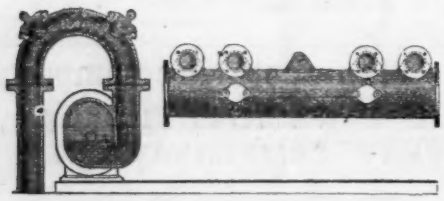

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THE VALUABLE IMPROVEMENT FOR SAVING and otherwise improving the gas, invented by Dr. J. S. Wood, described in the "Gas-light Journal" October 2d, 1866, is now for sale by State or County rights.

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PATENT LEAD-INCASED TIN PIPE COSTS LESS THAN LEAD PIPE AND IS MUCH STRONGER.

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INDORSED BY PHYSICIANS AND WATER COMMISSIONERS EVERYWHERE.

Recent improvements enable us to supply this pipe at a less price per foot than common lead pipe. To furnish the cost we should know the head or pressure of water and bore of pipe.

Pamphlets sent free. Address the

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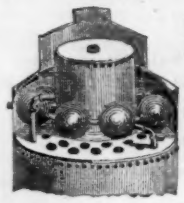

Requires only 25 lbs. of coal per day to the horse-power. Are made of the VERY BEST IRON, double lapped and double riveted.

Being upright, occupy little space, and are easily cleaned.

Without additional fuel, the Superheater increases the working capacity of the steam 25 per cent., which has been fully demonstrated by the many now in use. (See illustrated circulars). Address the

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Odorless Gas Heating and Cooking STOVES AND RANGES.

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I offer special inducements to parties wishing to purchase, my Pipe is Smooth, regular in weights, and cast vertically.

N. B.—Pipe from 3-inch and upwards, cast in 12-ft. lengths.

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Manufacturers of the

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This BAG-HOLDER is emphatically the FARMERS and GRAIN DEALERS FRIEND. Does the work of two boys in holding a bag open, and with it a farmer can bag up grain, potatoes apples, etc., as fast as two men in the ordinary way. It has large sales at the West, where first introduced. Retail price $5. Sent to any address.

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Is especially adapted for Builders, house Joiners, Masons, and Carpenters. With it a scaffolding can be built in less time upon a roof and with greater safety, and taken down as quickly, without leaving a single nail hole in the roof. Retail price $6 per dozen. Send for illustrated circulars as above. Orders promptly filled, at wholesale and retail.

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which cooks all vegetables and meats together, without flavoring each other, and does away with all offensive odors. SAVES LABOR, FUEL AND TIME.

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One trial will convince any one. Large numbers now in use and everybody pleased; sold low; several sizes—fit any stove—a whole dinner can be cooked on one stove-hole. Orders promptly filled, at wholesale and retail. Send for an illustrated circular, with full particulars. Retail price: 7 in. $4; 8 in. $5; 9 in. $7; 10 in. $10. Sent to any address on receipt of price.

H. BROWN'S PATENT
Metal Top Lamp Chimney,

First Quality Extra Annealed Glass

Will not crack or break from sudden changes of temperature, is readily cleaned, and with ordinary care should last just as long as the lamp on which it is used. Liberal discount allowed to the trade. Samples sent on receipt of fifty cents.

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PLASTIC SLATE

FOR

ROOFING & OTHER PURPOSES.

The process of reconstructing Slate Stone from a disintegrated state was

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It is a combination of

Pulverized late & Viscous Matter,

(the latter possessing qualities of geological and chemical affinity for the former,) and is a development of one of the simple but unalterable tendencies of nature.

As a Roofing Material it Stands Unrivalled.

A mastic—it adapts itself to every shape and slope. Non-combustible, impervious, non-expansive, and undecaying.

Frost does not Crack nor Heat Dissolve it.

The only roofing material ever discovered that will resist the action of the elements as long as the structure it protects. Being susceptible of little, if any wear, from exposure, and

Perfectly Fire-Proof,

It is unequalled as a coating for Railroad and Farm Buildings Fences, Bridges, bottoms of Vessels, Vaults, etc.

GAYLORD'S PATENT COUPLINGS,

Fig 5

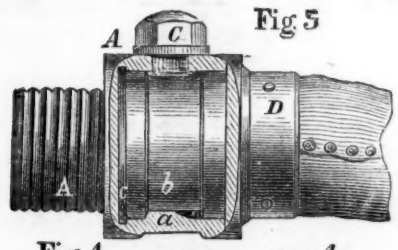


Fig 4

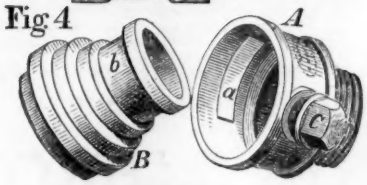
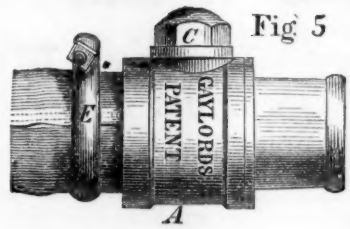


Fig. 5



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MANUFACTURED ONLY BY

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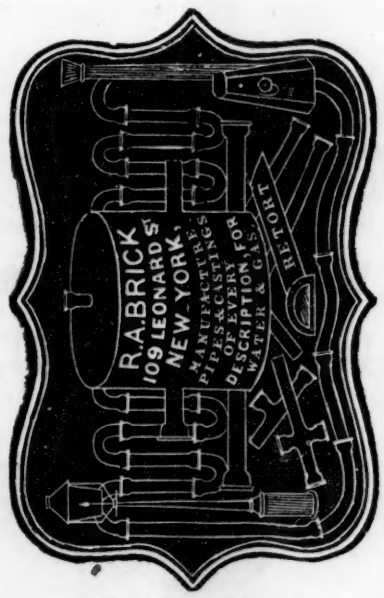
DRIVING PIPE,

BERGEN IRON WORKS,



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TUBES,

For Steam, Water, or Gas.

MANUFACTORY AND OFFICE,

Corner John and Adams Street, Brooklyn

ALSO

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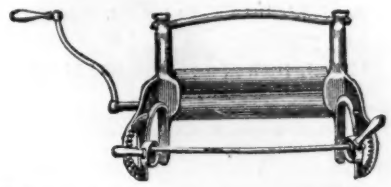
PUTNAM'S CLOTHES WRINGER.

IT IS THE ONLY RELIABLE

Self-Adjusting Wringer.



No Wood-work to Swell or Split. No Thumbscrews to get out of order. Warranted with or without Cog wheels.

It took the First Premium at Fifty-seven State and County Fairs in 1863, and nearly double that number in 1864, and is, without an exception, the *best* Wringer ever made. Patented in the United States, England, Canada, and Australia. Agents wanted in every town, and in all parts of the world. Energetic agents can make from $3 to $10 per day

WHAT EVERYBODY KNOWS, VIZ.:

That Iron well galvanized *will not rust.*
That a *simple* machine is better than a complicated one.
That a Wringer should be *self-adjusting, durable, and efficient.*
That thumb-screws and fastenings cause *delay* and *trouble* to regulate and keep in order.
That wood soaked in water will *swell, shrink,* and *split.*
That wood-bearings for the shaft to run in *will wear out.*
That the Putnam Wringer, with or without cog wheels, will *not tear the clothes.*
That cog-wheel regulators are not essential.
That the Putnam Wringer has *all* the advantages, and *not one* of the disadvantages above named.
That all who have tried it pronounce it the *best* Wringer ever made.
That it will wring a thread or a bed-quilt *without alteration.*

We might fill the paper with testimonials, but insert only a few to convince the skeptical, if such there be; and we say to all, *test* Putnam's Wringer. Test it *thoroughly* with *any* and any others, and if not entirely satisfactory, return it;

PUTNAM MANUFACTURING CO.—*Gentlemen:* I know from practical experience that iron well galvanized with zinc will not oxydize or rust one particle. The Putnam Wringer is as near perfect as possible, and I can cheerfully recommend it to be the best in use. Respectfully yours,

JOHN W. WHEELER, Cleveland, O.

Many years' experience in the galvanizing business enables me to indorse the above statement in *all particulars.*

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NEW YORK, *January,* 1864.—We have tested Putnam's Clothes Wringer by practical working, and know that it will do. It is cheap; it is simple; it requires no room, whether at work or at rest; a child can operate it; it does its duty thoroughly; it saves time, and it saves wear and tear. We earnestly advise all who have *much* washing to do, with all intelligent persons who have *any,* to buy this Wringer. It will pay for itself in a year at most. HORACE GREELEY.

PRICES—$8, $9, and $10.
Sample Wringers sent, express paid, on receipt of price.
Manufactured and sold, wholesale and retail, by

PUTNAM MANUF'G CO.,
13 PLATT STREET, New York,
BENNINGTON, Vt.,
CLEVELAND O.

WEED'S

HIGHEST PREMIUM

Shuttle Sewing Machine.

Has only to be seen and operated to be appreciated.

Call and see for yourself before purchasing. Please bring samples of various kinds of thread (such as is usually found at stores), and various kinds of fabric, which you know the former most popular sewing machines either cannot work at all, or at best very imperfectly.

SUPERIORITY

over any other machine in the market will be seen at a glance:

1st. It runs easily and rapidly, and is so constructed as to endure all kinds of hard usage.
2d. No breaking of threads in going over seams.
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5th. The Weed Machine will do beautiful quilting on the bare wadding, without using inner lining, thus leaving it soft as if done by hand.
6th. The variety of fancy work that can be done on the

WEED MACHINE,

with so little trouble, make it equal, if not superior, to six machines combined; for instance, it binds, tucks and sews on the band at the same time, and in fact, the

WEED NO. 2 MACHINE,

as before stated, is equivalent to a combination of any six ordinary machines.

Orders for machines may be sent through the American Advertising Agency, 389 Broadway, New York.

Below we give a few prices.

No. 2. Oil Black Walnut, Ornamented with Hemmer.	$60,00
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No. 3. Extra Oil Polished Black Walnut, Half Case, Large Table beautifully Ornamented.	75,00

WEED SEWING MACHINE Co.,
186. 506 Broadway, New York.

THE AMERICAN METER CO.

Organized under the General Manufacturing Laws of the State of New York

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This Company is now prepared to furnish WET AND DRY GAS METERS, STATION METERS, GOVERNORS, PRESSURE INDICATORS AND REGISTERS, SERVICE and METER COCKS, and all other articles in their line appertaining to the use of Gas-Works.

The combination of Mechanical and Scientific Skill, and the long experience of the several members of the Company, is a sure guarantee of durability, accuracy and excellence of workmanship. Orders addressed

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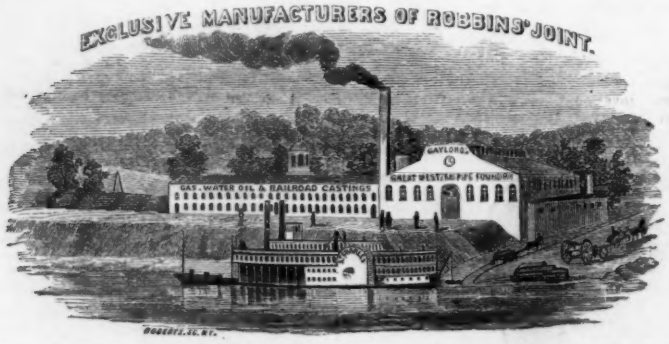
Practical Gas Meter Manufacturers,

Continue as heretofore at the OLD ESTABLISHMENT, Nos. 1115 and 1117 Cherry Street, Philadelphia,

To manufacture Wet and Dry Gas Meters, Station Meters, Experimental Meters, Meter Provers, Centre Seals, Governors, Pressure Registers, Guages, Indicators, Photometers, and all kind of Gas Apparatus; also furnish all other Articles appertaining to the use of Gas Works.

From our long Practical Experience of the Business (covering a period of 20 years) and from our personal supervision of all Work, we can guarantee all orders to be executed promptly, and in every respect satisfactorily.

J. Wesley Harris, Washington Harris, Wm. Wallace Goodwin



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EXCLUSIVE MANUFACTURERS OF ROBBINS' JOINT.

Manufacturers of Gas, Water, Oil and Railroad Castings.

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PIANO FORTE MANUFACTURERS,

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THE ATTENTION of the public and the trade is invited to our New Scale, Seven Octave, Rosewood Piano-Fortes, which for volume and purity of tone are unrivalled by any that have hitherto offered in this market. They contain all the modern improvements, French Grand Action, Harp Pedal, Iron Frame, Over-strung Bass, etc., and each instrument, being made under the supervision of Mr. J. H. Grovesteen, who has had a practical experience of over thirty years in their manufacture, is fully warranted in every particular.

THE "GROVESTEEN PIANO-FORTE"
RECEIVED THE HIGHEST PREMIUM AT THE
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Where were exhibited instruments from the best makers of London, Paris, Germany, Philadelphia, Baltimore, Boston, and New York; and also at the American Institute for five successive years, the gold and silver medals from both of which can be seen at our warerooms.

By the introduction o improvement we make a still more perfect Piano-Forte, and by manufacturing largely, with a strictly cash system, are enabled to offer these instruments at a price which will preclude all competition.

PRICES

No. 1,	Seven Octave, round corners, Rosewood,	Plain Case,	$300
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a fac-simile of the accompanying cut.

TERMS—Net Cash, in current funds Descriptive circular sent free on application.

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Manufacture Wrought Iron Welded Tubes for Gas, Steam or Water; Lap-Welded Boiler Flues, GALVANIZED WROUGHT IRON TUBES,

ARTESIAN WELL PIPES,

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MANUFACTURERS OF EVERY DESCRIPTION OF GAS MACHINERY.

Retorts, Bench Castings, Condensers, Washers, Scrubbers, Wet or Dry Lime Purifiers, Coke Wagons, Fire Tools, Wrought Iron Grate Bars, Gasholders, either Telescopic or Single, with Suspension Frames complete; Wrought Iron Roof Frames, for Iron or Slate; Stop Cocks, Exhausters, Steam Pumps, Boilers and Tanks, Steam or Hand Air Pumps for proving Street Mains, Centre Seals, Governors, Wrought or Cast-Iron, Line Sieves for Purifiers, Hoisting Machines for Lifting Purifier Covers.

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PIG IRON & CAST IRON GAS & WATER PIPES.

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THE UNDERSIGNED DESIRES TO undertake the supervision of several small Gas-works, to visit and examine them as often as may be necessary; to obtain and inspect their coal, castings, fire-brick, and other materials; and to manage their general business in such a manner that they shall be under such supervision as is now attainable in large works, at much increased cost. Also, to advise as general Consulting Engineer and expert in practical chemistry.

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Late Asst. Engineer of the Philadelphia Gas-works
417 Walnut st., Philadelphia.

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NEW PATENT

GAS APPARATUS

For Country Residences, Public Buildings, &c.,

FROM $300 UPWARDS.

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Gas Fitting in all its branches

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Steam Pump Manufacturing Company,

MNUFACTURERS OF THE WOODWARD PATENT IMPROVED

SAFETY STEAM PUMP,

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Steam, Water & Gas Fittings of All Kinds

Also, Wholesale and Retail Dealers in WROUGHT IRON PIPE, BOILER TUBES, etc.,

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OPPOSITION LINE.

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PASSAGE AND FREIGHT AT REDUCED RATES.

Sailing days from New York.
1867.

February 20th, March 10th and 30th.
" April 20th, May 10th and 30th.

And so on at intervals of twenty days, leaving on the Saturday previous, when a regular sailing day comes on Sunday.

For further information, apply at the Company's office, 177 West-st., corner Warren-st., New York.

66tf D. N. CARRINGTON, Agt.

R. D. WOOD & CO.,
MANUFACTURERS OF
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Office, 400 Chestnut street,
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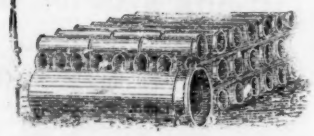

FINKLE & LYON'S

New Family

SEWING MACHINE

Should be known in

IN EVERY TOWN.

To accomplish this at once and save the expense of a *Travelling Agent*, we offer thus, viz:

Any one sending us orders for two machines shall receive one machine free of charge. This proposition cannot avail after we have appointed a local agent in the town.

We have now completed our *new manufacture* at a cost of some $200,000—introducing *new patents*, and such important improvements, that without fear we are able to offer the following stringent guarantee, viz: After a fair trial, if any purchaser does not prefer the FINKLE & LYON FAMILY SEWING MACHINE to any other, he can return it and have back his money.

This machine has taken many of the HIGHEST PRIZES; *is less complicated than any other first class machine; does a wider range of work without changing; requires no taking apart to clean or oil, no "lessons" to set needle, regulate tension or operate machine.*

Our new Manufacturing Machine is sold on the same terms as the Family Machine.

Please send for a circular with samples of sewing.

Finkle & Lyon S. M. Co.
No. 581 BROADWAY, NEW YORK.

Great Improvement

IN

Sewing Machines.

EMPIRE SHUTTE MACHINE!

Patented February 14th, 1860.

Salsroom, 536 Broadway.

This Machine is constructed on entirely new principles of mechanism, possessing many rare and valuable improvements, having been examined by the most profound experts, and pronounced to be SIMPLICITY and PERFECTION COMBINED.

It has a straight needle, perpendicular action, makes the LOCK or SHUTTLE STITCH, which will NEITHER RIP nor RAVEL, and is alike on both sides; performs perfect sewing on every description of material, from Leather to the finest Nansook Muslin, with cotton, linen, or silk thread, from the coarsest to the finest numbers.

Having neither CAM nor COG WHEEL, and the least possible friction, it runs as smooth as glass, and is

Emphatically a Noiseless Machine!

PRICE OF MACHINES,

COMPLETE:

No. 1, Family Machine, with Hemmer, Feller, Gauge, Braider, & Corder, complete. - - - $60
No. 2 Small Manufacturing, with Extension Table, $75
No. 3. Large Manufacturing, with Extension Table, $85
No 3. Large Manufacturing, for Leather, with Rolling Foot and Oil Cup, 100

One-half hour's instructions is sufficient to enable any person to work this Machine to their entire satisfaction.

Agents Wanted in all Towns in the United States, where Agents are not already established. Also, for Cuba, Mexico, Central and South America, to whom a liberal discount will be given Terms, invariably CASH on delivery.

T. J. McARTHUR & CO.,
536 Broadway.

GAS-BURNERS.

WIGHTMAN BROS.,

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For the United States and Canada, of

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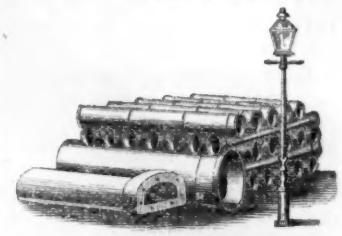

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Pianos.

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Manufacturers of Piano Fortes, with their Patent Combination Sounding-boards,

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This invention, introduced exclusively into our Pianos, is of the greatest advantage to the tone of the Instrument, as it affects the sounding-board the very soul of the Piano, and produces thereby a pure liquid tone greatly superior in quality and power to that of the ordinary Piano. The sounding-board released from its connection with the Piano case, and resting upon under soundingboards, is relieved from the rigidity caused by such connection, and its vibratory quality increased. Our Pianos are first class in every respect, and purchasers will have not only our own guarantee as to their quality, but also the guarantee of the reputation of the instrument, obtained from the experience of our patrons who have used them for a generation. All lovers of this eminently household instrument, as well as parties proposing to purchase new Pianos, are invited to call and examine our assortment. 96-1y

The "Standard" Burner.

To those who have not the advantage of gas light, and have to use kerosene, there is nothing more essential than to have a good burner. Several improvements have of late been brought before the public, but none, perhaps, seem to have the effect desired as the "Standard" burner, which is herewith illustrated, and which we have no doubt will receive the approval of the millions.

The illustrations herewith shown give a very clear idea of its general arrangement, and if allowed to speak for itself (by actual test) it is sure to make the most favorable impression. But to those who have not the opportunity of seeing it, the patentees say that in points of utility, economy, durability, and convenience, either separately or collectively, it has no equal.

1st. All the light generated is made available, as it has no metallic deflector to obstruct or conceal it.

2nd. The draft is so perfectly adjusted to the combustion, that the greatest possible amount of light is produced from the oil consumed.

3rd. All the parts of the burner are substantially made, and securely fastened by rivets.

4th. The chimney being hinged to the burner, is simply thrown backwards, as is shown in the lower illustration, to light or trim; and being always attached to the lamp is free from all liability to breakage by being dropped, upset, or carelessly laid down while hot—all fruitful causes of breakage with other burners. In a word, the "Standard" is the most perfect burner ever made.

It heats less than any other.

It is the safest of all burners for light oils.

It is unsurpassed for the heaviest oils.

It can be used with any common lamp chimneys.

It is what everybody wants and will have.

Messrs. Judson & Beers, 95 Maiden Lane, are the manufacturers of this burner, of whom further information can be obtained.

Paper for Building Purposes.

In building houses it has become a common practice for the builders to buy the doors and windows already made. It is now proposed to supply them in like manner with the walls and ceilings, in the form of slabs, to be used as a substitute for lath and plaster. These slabs are made of cane fiber—a cheap material, obtained from the cane of the Southern cane-brakes, by disintegration effected by the explosive force of steam, and costing about ten dollars a ton, mixed with clay, resin, size, and other cheap materials. The cane fiber is also made into paper of various kinds.

The following advantages are claimed for this new building material: In a few hours all the walls and ceilings of a house can be put up by nailing them to the ordinary battens upon which the laths are nailed. The work can be done as well in winter as in summer time, and no drying is required. The fibrous slabs do not warp, crack, break, peel, shell, crumble, nor decay; and they keep out damp, heat, and cold better than lath and plaster. They are somewhat similar but asserted to be superior to the panels or wainscoting found in many palaces and mansions in England. Their cost is said to be less than half the cost of common lath and plaster. It is proposed to make them fire-proof and water-proof, that they may serve for the roofs and outer walls of houses better than clapboard and shingles.

According to estimates which have been made, the cost of an ordinary cottage house will be very much less than the present cost of a frame house of the same size; and it is claimed fibrous slab houses can be erected in less than one fourth of the time now required to erect other houses.

Anti-Incrustation Solution.—To prevent the formation of strongly adhesive sediments in a steam-boiler, mix 125 kilograms of chrystalized chloride of barium dissolved in 50 of water, with 25 kilograms of hydrochloric acid having a specific gravity of 1.20; apply 15 parts by measure of this acid solution, to every 1,000 parts of water to used in the boiler.

Advertising Index.

☞ In looking for advertisements, see figures 1 to 9, within brackets, at head of advertisement pages.

GAS-BURNERS, APPARATUS, ETC.

Arnold's Metallic Gas Trays—T. G. Arnold, 334 and 336 West 21st street, N. Y. 3
American Meter Company, 512 West 22d street, New York 8
Automatic Gas Purifier—State Rights for sale—Wm. C. Turnbull, care of T. C. Babcock, 59 Broadway, or office of the American Gas-Light Journal 2
Builder of Gas Works, Apparatus, Etc.—P. P. Deily, 39 Laurel street, Philadelphia 3
Contractors for Gas-works, Etc.—Murray, Baker & Walker, Fort Wayne, Ind 3
Gasoleine,—J. W. Wheelock, 284 Pearl st., New York 4
Gas Coals—Bird, Perkins & Job, 104 Wall street, New York 4
Gas Engineers and Contractors—Hoy, Kennedy & Co., 111 Liberty street, New York 4
Gas-Burners—C. Gefrorer, 529 Commerce street, Philadelphia, Pa 9
Gas Meter Manufacturers—Harris & Bro., 1117 Cherry street, Philadelphia, Pa 8
Gas Superintendent—C. M. Cresson, 417 Walnut st., Phil., Pa 9
Gas Apparatus, &c.—Geo. H. Kitchen & Co., 561 Broadway 9
Gas Burners—Wightman Bros., 25 Kilby st., Boston, Mass 9
Gas Burners—T. G. Arnold, 224 and 226 West 21st st., N. Y. 9
Gas Burners—W. Anderson, cor Franklin & Elm sts., N. Y. 1
Gas Works for Sale—Colonel J. A. Sabbaton, Manhattan Gas Works, N. Y. 1
Gas Engineer—James R. Smedberg, 22 Pine street 3
Gas Stoves—A. L. Bogart, 792 Broadway 6
Gas Fixtures, Meters, Etc., Etc.,—McIlenry & Carson, Cincinnati, Ohio 3
Haskins' Gas Stoves—Ford & Murray, 29 East 13th street 3
Metropolitan Gas Stove Co., 702 Broadway, New York 2
Plumbers, Gas and Steam Fitters—Moore & Gaussen, 221 West Fifth street, Cincinnati, O. 4
Patent Gas Exhauster—Smith & Sayre, 484 Broadway 5
Purifying Trays—Jno. L Cheeseman, 147 and 149 Ave. C, N.Y. 3
Solar Gas Machines—Smith & Drake, 726 Broadway 2
To Gas Engineers and Gas Companies 3

FOUNDRIES.

Brooklyn Tube Works—B T Benton, Brooklyn 7
Bergen Iron Works—Driving Pipes and Bands—R. A. Brick, 109 Leonard street, N Y. 7
Columbian Iron Works—Wm. Taylor & Sons, 11, 13 and 15 Cast Iron Pipes and Fittings—B S. Benson, 52 East Monument street, Baltimore, Md 4
Adams street, Brooklyn, N. Y. 6
Dealers in Iron, Copper, Brass, etc.—T. Cassidy & Co., corner of Bridge and John streets, Brooklyn, N. Y. 4
Erie Basin Iron Works—Elizabeth, Dwight and Van Dyke sts., South Brooklyn, N. Y 2, 6
Gaylord's Great Western Pipe Foundry—Office 90 and 8
Broadway, Cincinnati, Ohio 92
Louisville Pipe Works—Dennis Long, Cor. 9th and Water-sts., Louisville, Ky 9
Manufacturing Enamelers—Nessle & Taylor, 97 Water street, Brooklyn, N. Y 4
National Foundry and Pipe Works—Wm. Smith, Carroll, Pike, Smallman and Wilkins streets, Pittsburgh, Pa 6
Oregon Iron Foundry—Herring & Floyd, 738, 740, 742 and 744 Greenwich street, New York 6
Pascal Iron Works—Morris, Taskar & Co., Philadelphia, Pa 9
Southwark Foundry—Merrick & Sons, Fifth and Washington streets, Philadelphia 9
Wrought Iron Pipes, etc.—Joseph Nason & Co., 61 Beekman street, New York 4

WATER METERS, PUMPS, ETC.

Aubin Water Meter—H. Q. Hawley, Albany, N. Y. 4, 9
Babcock & Wilcox's Stationary Steam Engines 3
Davis' Steam Superheating Boiler—Duplex Steam Boiler Mf'g Company, Long Island City, N. Y. 9
Gaylord's Patent Couplings—Gaylord Patent Coupling Co., 31 and 33 Dey street, N. Y. 7
Pat. Lead-Encased Tin Pipes—Colwells, Shaw & Willard, foot of West 27th street, N. Y. 6
Patent Dry Centre Valve—American Meter Company, 512 West 22d street New York 5
Steam Pumps—H. R. Worthington, 61 Beekman st. New York 6
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Worthington's Water Meters—H. R. Worthington, 61 Beekman street, New York 2
Woodward Steam Pump Mf'g Co. 76, 78 Centre st. New York 9

CLAY RETORT WORKS.

Bay State Clay Retort Works, 125, 127 Water st. Boston, Mass. 6
Brooklyn Clay Retort Works, Van Dyke st. Brooklyn, N. Y. 5
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Bird Cages—Osborn Manufacturing Company, 109 Bleecker st. 1
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Empire Shuttle Machine—T. J. McArthur, 536 Broadway 9
Empire Sewing Machine Company, 616 Broadway 3
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Pianos—Raven & Bacon, 644 and 646 Broadway, N. Y. 9
Prospectus of the Literary Journal of Science and Art 3
Putnam's Clothes Wringer—Putnam Mf'g Co., 18 Platt street, New York 7
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Situation Wanted as Manager of a Gas Work 3
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☞ All communications to be addressed to "The Editors," No. 22 Pine Street, New Yo

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